

Etch Product Characterization for High-K and Low-K Plasma Etching Processes

Mathew Radtke¹ and David Graves¹

¹University of California at Berkeley
Department of Chemical Engineering
University of California at Berkeley
Berkeley, CA 94720
USA

Plasma and chamber effluent characteristics and composition are used to assess both the process implications and EHS impact of etch processes for selected new materials. The unusually large set of potential new materials and etch chemistries for high k and low k dielectric materials makes development of a systematic methodology for simultaneous process and ESH assessment especially important and challenging. Early identification of ESH impacts of new materials and processes is crucial for simultaneous selection of processes and chemicals and minimizing ESH impacts. Etch products and other plasma species are detected using dual quadrupole mass spectrometers, optical emission spectroscopy, a Langmuir probe, and an ion flux monitor. An FTIR is used to detect stable etch products in the chamber foreline. Etch product re-deposition is measured using in-situ quartz crystal microbalances. Thorough characterization of plasma chemical and physical properties is the first step in developing a systematic methodology for assessing ESH and process implications of new plasma etch chemistries.